

USER INTERFACE DEVICE

FIELD OF THE INVENTION

[0001] The present invention relates to a user interface device particularly but not exclusively for a mobile telephone handset or digital communicator handset.

BACKGROUND ART

[0002] Portable electronic apparatus are increasingly able to support powerful software applications requiring sophisticated user interfaces. For example, laptop computers, mobile telephone handsets, personal digital assistants (PDAs) and digital communicator handsets can run browser software which enables a user to navigate content on a web page by selecting hypertext links.

[0003] Conventional mobile telephone handsets have an alphanumeric keypad comprising a set of dual-state keys arranged in a grid pattern. Although the keypad is appropriate for entering text and numbers, it is not particularly suited to navigating a web page because movement of a pointer or cursor is restricted to discrete steps and is constrained to orthogonal directions defined by the grid pattern.

[0004] The present invention seeks to provide an improved user interface.

SUMMARY OF THE INVENTION

[0005] According to the present invention, there is provided a user interface device for electronic apparatus, the device comprising a keypad having a plurality of keys each arranged to actuate a respective switch so as to provide a first type of user input and integrally disposed impedance sensor so as to provide a second type of user input.

[0006] The keypad may include a region provided with said impedance sensor but without a key. The keys may be comprised in a keymat and the impedance sensor may be disposed beneath the keymat. The keymat and the impedance sensor may be coextensive. The keys may comprise silicone rubber and may include a hard coat.

[0007] The impedance sensor may be arranged to detect the presence of a digit and may comprise first and second sensing plates.

[0008] The first sensing plate may comprise a first set of electrodes, arranged in noncontiguous stripes. The electrodes may be transparent and made from indium-tin-oxide. The first sensing plate may comprise a substrate, which is transparent and made from polyethylene terephthalate.

[0009] The second sensing plate may comprise a second set of electrodes. The first and second set of electrodes are spaced apart. A first member of the first set of electrodes and a first member of the second set of electrodes may be arranged to have a mutual capacitance and configured so to allow the mutual impedance to change when a digit touches the keypad.

[0010] The impedance sensor may be a capacitive sensor.

[0011] The device may further comprise a light source to illuminate the keypad, disposed behind the keys and may be planar. The light source is an electroluminescent layer.

[0012] The first type of user input may be input of alphanumeric data and the second type of user input may be control of a focus on a display of the electronic apparatus.

[0013] According to the present invention there is also provided an electronic apparatus incorporating a user interface device comprising a keypad having a plurality of keys each arranged to actuate a respective switch so as to provide a first type of user input and integrally disposed impedance sensor so as to provide a second type of user input.

[0014] The electronic apparatus may be portable and may be a mobile telephone, communicator handset or personal computer.

[0015] According to the present invention there is also provided a method of fabricating a user interface device for electronic apparatus, the method comprising providing a keypad having a plurality of keys each arranged to actuate a respective switch so as to provide a first type of user input and integrally disposing impedance sensor so as to provide a second type of user input.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] An embodiment of the present invention will now be described by way of example with reference to the accompanying drawings, in which:

[0017] **FIG. 1** is a perspective view of a mobile telephone handset;

[0018] **FIG. 2** is a schematic diagram of mobile telephone circuitry;

[0019] **FIG. 3** is an exploded perspective view of an embodiment of the present invention;

[0020] **FIG. 4** is cross-sectional view taken along the line A-A' as shown in **FIG. 3**;

[0021] **FIG. 5** is a plan view of the embodiment shown in **FIG. 3** and

[0022] **FIG. 6** shows a pointer displayed on a screen of the mobile telephone handset.

PREFERRED EMBODIMENT OF THE INVENTION

[0023] Referring to **FIGS. 1 and 2**, a mobile telephone handset **1** comprises a case **2**, a battery **3**, a liquid crystal display (LCD) panel **4**, a microphone **5**, ear piece **6**, a keypad **7** having a key interface **8** and a capacitive sensor interface **9**, an antenna **10**, subscriber identification module (SIM) card **11** and SIM card reader **12**. The mobile telephone circuitry includes radio interface circuitry **13**, codec circuitry **14**, controller **15** and memory **16**. Individual circuits and elements are of a type well-known in the art, for example a Nokia range in mobile telephones.

[0024] Referring to **FIGS. 1, 3, 4 and 5**, cutaway portions **7'**, **2'** of the keypad **7** and case **2** are shown. The keypad **7** comprises a silicone rubber keymat **17** having a plurality of keys **18**. Letters and numerals are laser-etched into the surface of the keys **18** and the keys **18** are provided with a hard protective coat (not shown). A capacitive sensor **19** lies beneath the keymat **17** and comprises first and second sensing plates **20, 21**. The first sensing plate **20** comprises a first set of striped indium-tin-oxide (ITO) electrodes **22**